Modal logic and Metaphysics

Introduction

- Given a team of scientists, unlimited time and resources, and enough patience, you could observe a lot about the world.

  You could observe the behavior of electrons, protons, atoms, molecules,organisms, societies, planets, stars, and galaxies.

- But there are some facts about the world that you could not observe, no matter how big your research budget was.

  You could only see how the world is, not how it could have been or had to be. That is, you could not observe **possibilities and necessities**.

- Not everything is possible.

  Unlike unicorns and 10-feet-tall humans, round squares and married bachelors are impossible.

- In a sense you will observe necessities, since things that must happen do happen.

- But you won’t observe that they are necessary, only that they are actual.

- Drop stones again and again, and you will see them fall each time, but you will never observe anything more than a regularity

Epistemology

- We cannot observe **merely** possible facts.
- We do not observe **necessary** facts. We just see regularities over and over. We do not see the “must”

→ If not by observation, how do we know?

(empiricism)

Metaphysics

- What **actual** events are is easy to understand.

- Merely possible events?

  Ghostly events? (hard to believe. And they do not explain possibility: just actual ghostly events)

- And necessity: what determines the ‘must”?

Different meanings

- Different senses of modal vocabolary.

  - Epistemic (“La Triestina ha vinto?” “E` possibile.”)

  - Deontic/ moral (“one cannot (mustn’t) cheat in exams”)

  - Alethic: (“objects necessarily fall to earth”)

  (alethic: about truth. Necessity and possibility are considered as ways (modes) of being true.

- Alethic sense:

  “It is necessarily true that…”

  “It is possibly true that...”

Alethic modalities

Natural and Absolute modality

- **Natural** possibility and necessity concern **laws of nature**.

  (“Anyone with certain DNA **must** have blue eyes.”)

- A problem, however, is determining what a law of nature is.

- This is not an objection, but a gap that must be filled.

What are laws of nature?

- Laws made and enforced by whom? God?

  No.

  Because even certain particular events would be due to God, but they are not laws of nature.

  (es. Numero degli alberi nel carso)

- Regularities?

  No.

  Because 1. necessity would be missing 2. what explains the single events? 3. laws would be too global. 4. Some regularities are not laws.

- It seems that we need a notion of necessity to understand laws of nature.

- So we need a notion of necessity potentially prior to that of physical/natural necessity.

Absolute necessity

- However, there is also a more general notion of necessity.

- After all, natural necessity does not seem necessary in the strongest sense.
- Natural necessity does not seem **absolute**.

- Violations of laws of nature can be **imagined**.
- Laws of nature themselves could have been different.

- But, some necessary claims cannot be imagined to be false (married bachelors, contradictions,…)

  → This sense of necessity is the broadest. It is **absolute**.

  Very few things are absolutely necessary.

  (related to essences)

- We will mostly deal with alethic modality
- We will mostly deal with absolute modality.

  (So, **absolute alethic modality**)

- Examples of absolute necessity and modalities?

Methodological intermezzo:

- Note how we proceeded.

  Before entering our study, we spent time to clarify the crucial terms we are using.

  Tracing distinctions and defining notions.

- We did that trying to be clear, understandable. So we used a simple language and gave examples.

- More technical vocabulary (alethic, absolute, and so on)

  is always introduced only if needed. With an explicit definitions and a comment to clarify them.

  Examples of good and bad applications are also provided.

- What ‘being clear’ is:

  “being clear means putting the listener in the easiest position to falsify you”

More specific problems of modality

Extensions and Intensions

- Philosophers have recognized a semantical distinction between **extension** and **intension** of a linguistic expression**.**

- The extension of a denoting expression (names, definite descriptions,...) is its **referent**.

- For example:

  The referent of “Andrea Strollo” is me.

  The referent of “The teacher of this course” is still me.

  The referent of “The capital of Italy” is Rome

- The extension of a predicate is the set of things the predicate applies correctly to.

- For example, when extension of the predicate “is red” is the *set* of all red things.

- The extension of a relation is the set of all ordered pair, such that the former is in the intended relation with the latter.

  (_ loves_ = the set of (x,y) such that x loves y)

- Extensions have a big virtue:

  they have clear identity conditions.

- “Rome” and “The current capital of Italy”

  have the same extension because they have the same referents (they refer to the same city)

- “Andrea Strollo” and “Rome” have different extensions, because I am not identical to Rome.

Methodological intermezzo:

That identity conditions are clear does not mean that we always know when they hold.

Some extensions can be identical even we do not know it.

Metaphysics is not epistemology.

- Two predicates have the same extension if they stand for the same set.

  “is red” and “has the same main colour of China flag” denote the same set of things.

  → Set theory tells use that two sets are the same if they have the same members.

- The **intension** of a expression is less definite.

  It is its *sense* or *meaning*.

- “The capital of Italy” and “The teacher of this course” have different meanings.

- Intensions are more problematic because it seems that they do not have clear identity conditions.

- When are two meanings the same?

- One could try to reduce intensions to extensions.

  So having the same meaning is just having the same extension.

- But this clearly does not work.

- “Andrea Strollo” and “The teacher of this course” have the same extension, but they have different meanings.

- The problem also arises for predicates.

- “Having a heart” (being cordate) and “having a kidney” (renate) have different meanings.

- Consider then their extension.

  Namely, the set of animals with hearts and the set of animals with kidneys.

- Since the animals with hearts are the animals with kidneys (as a matter of fact), the two predicates have the same extension.

  But their meaning is clearly different!

- So meaning cannot be reduced to extensions.

- The problem of the meaning of predicates extend to properties.

- If the meaning of predicates are properties.
- The problem becomes: “what is a property?” “When are ‘two” properties the same?”

- The problem is striking in the case of propositions.

- The extension of a sentence is a truth value.

  The extension of “snow is white” is Truth.

  The extension of “grass is purple” is Falsity.

- However, clearly two sentences can have the same extension but not the same meaning.

  “Rome is in Italy” is also true but it has a different meaning from “snow is white”

- Quine, with similar considerations, rejected intensional entities, like properties, propositions and so on.

- For Quine intensions are *creatures of darkness*.

- What is the core of the problem?

  The problem is that some animals **could** have hearts without having kidneys.

- It is not **necessary** that animals with hearts also have kidneys.

- Similarly, it is not necessary that Andrea Strollo is the teacher of this course.

- Someone else could have been.

- So we might try to say that two expressions have the same meaning if they have the **same extension necessarily**.

- This would solve the problematic cases above.

- But to do that, we need to understand how **possibility** and **necessity** claims and reasoning work.

- Do we?

A problem of substitution

- A semantics is **extensional** if the truth value of every sentence is determined entirely by the extensions of its component (and its syntactical form).

- In an extensional semantics a **substitution principle** holds:

  if two expressions are **co-extensional** (namely they have the same extension),

  then one can be substituted for the other in any sentence with no change in truth value (*salva veritate*).

- For example:

  - “Rome is in Italy” is true

  - The extension of “Rome” = the extension of “the capital of Italy”

  - So (if extensionality holds) we should be able to replace one with the other with no change in truth value.

- Indeed:

  “The current capital of Italy is in Italy” is also true.

- Or consider:

  the extension of the conjunction “snow is white and grass is green” is Truth.

  Now replace “snow is white” with “Rome is in Italy” which are both true.

- We get: “Rome is in Italy and grass is green” which is still true.

- So extensionality holds for these kinds of statements.

- Extensionality is a good feature of a semantics, since we can understand well how it works and what extensions are.

- We can avoid intensions, which are problematic.

- So it is apparently a good thing, if we can give an extensional treatment for a certain discourse.

- But, and this is the problem, in statements about **necessity and possibility extensionality may fail**.

- “Necessarily, eight is an even number” is true

  the number of planets of the solar system = eight

  But:

- “Necessarily, the number of planets of the solar system is an even number” is false.

- Or consider:

  “Necessarily, 2=2=4”, which is true.

  Replace “2+2=4” with “Rome is in Italy” which is also true.

- We get:

  “Necessarily, Rome is in Italy” which, instead, is false.

- So, modal discourse is, apparently, not extensional.

- It follows that we seem not be able to make a clear sense of it.

  If so, we can hardly reason about modality.

- One might save modal discourse by proposing that substitution in modal discourse should be allowed for expressions that are **intensionally** equivalent (rather than extensional).

- But: 1. Intensions are suspect.

2. We were trying to use modality to clarify intensions.

Now we are appealing to intensions to understand modality.

So, we are in a vicious circle.

- For similar reasons, Quine was also skeptic of modal logic and modal notions (and other semantic notions as well).

- Was Quine right?

- Can these problems be solved?

- Can we give an extensional semantics for modal notions?